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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/757,751	01/14/2004	Qiao Li	SP03-009	4269

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EXAMINER	
SONG, MATTHEW J	

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 11/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/757,751	LI ET AL.	
	Examiner	Art Unit	
	Matthew J Song	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) *10-12* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *1/14/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

   I. Claims 1-9, drawn to a method, classified in class 117, subclass 81.

   II. Claims 10-12, drawn to a product, classified in class 423, subclass 462.

2. The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the process as claimed can be used to manufacture another and materially different product, such as with a diameter less than 250 mm.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Walter Douglas on 10/27/2004 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-9. Affirmation of this election must be made by applicant in replying to this Office action. Claims 10-12 are

withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

6. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 recites, " wherein the fluoride starting material is selected....magnesium fluoride and strontium" in the last 2 lines. Strontium cannot be a fluoride starting material because strontium does not contain any fluorine. The Office has interpreted strontium to mean strontium fluoride to expedite prosecution.

7. Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 4 requires the temperature difference between the two zones is less than 50°C during crystal growth and cooling to a first temperature. Applicants' also claim and teach the first temperature is between 1100-1300°C (claim 3). The melting temperature of calcium fluoride is 1420°C, which is what the first temperature zone is require to be at in order to melt calcium fluoride starting material ([0020] of instant specification). It is unclear how the temperature

difference can be 50°C during growth when the temperature of the first zone is minimally 1420°C and the temperature of the second zone is taught to be between 1100-1300°C .

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1, 2, 3, 5, and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Garibin et al (US 2002/0185057).

Garibin et al discloses a method of manufacturing a fluoride crystal comprising an apparatus having a crystallization zone and an annealing zone, this reads on applicants' melting and cooling zone, respectively. Garibin et al also discloses heating a fluoride starting material in a crystallization zone to 1500±50°C, this reads on applicants' temperature equal to or greater than its melting temperature to form a melt. Garibin et al also discloses growing fluoride crystal from the fluoride melt by cooling the melt from the melting temperature to a first temperature, 1100-1300°C, below the melting temperature by lowering the melt from the melting zone into the cooling zone and controlling the temperature of the two zones. Garibin et al also discloses the temperature of the two zones is independently controlled so that there is a temperature drop of 250°C with a temperature gradient of 8-12°C/cm, this reads on applicants' controlling the temperature difference between the two zones is minimized during crystal formation. Garibin et

al also discloses annealing and cooling at a rate between 2-8°C/hr, this reads on applicants' cooling the crystal from the first temperature to a final temperature at a substantially constant cooling rate ([0016]-[0024] and claims 1-6).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garibin et al (US 2002/0185057) as applied to claims 1, 2, 3, 5, and 6 above, and further in view of Sakuma et al (US 2002/0038625).

Garibin et al discloses all of the limitations of claim 6, as discussed previously, except the constant cooling rate is less than or equal to 3°C/hr or less.

In a method of manufacturing calcium fluoride crystals, Sakuma et al teaches an annealing process that is conducted in order to improve the optical properties of a single crystal of calcium fluoride. Sakuma et al also teaches the optimum maximum temperature for annealing is between 1020-1150°C, this reads on applicants' first temperature below the melting temperature, and the cooling speed from the maximum temperature to room temperature is set to be 2°C/hr or less, this reads on applicants' constant cooling rate ([0052]-[0056]). Sakuma et al also teaches the slower the cooling speed, the greater than effect of the improvement on the optical properties. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Garibin et al with Sakuma et al's annealing method using a cooling speed of 2°C/hr or less to improve the optical properties of the fluoride crystal, as taught by Sakuma et al.

Referring to claims 8-9, the combination of Garibin et al and Sakuma et al is silent to the claimed optical properties for average homogeneity and birefringence, however these properties would are inherent to the calcium fluoride crystal taught by the combination of Garibin et al and Sakuma et al because the combination of Garibin et al and Sakuma et al teaches a similar method of crystal growth and annealing. Furthermore, the combination of Garibin et al and Sakuma et al teaches a cooling rate of less than 2°C/hr and applicants' teach the claimed properties are obtained by using a cooling rate of less than about 3°C/hr (pg 6 [0021] of the instant specification).

12. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Price (US 2002/0066402) in view of Sakuma et al (US 2002/0038625).

Price discloses a method of manufacturing a fluoride crystal comprising heating a fluoride starting material in the melting chamber of a growth furnace having a melting chamber and an annealing chamber (Abstract and [0035]), this reads on applicants' melting zone and cooling zone, to a temperature equal to or greater than its melting temperature to form a melt. Price also discloses growing a fluoride crystal from the fluoride melt by cooling the melt from the melting temperature to a first temperature below the melting temperature by lowering the melt from the melting zone into the cooling zone ([0038]). Price also discloses heaters at the top and bottom of a stack of crucible is to provide uniform temperature distribution across the stack, which reduces thermally induced stresses ([0037]) and the melting chamber and annealing chamber have associated heating elements for maintaining an appropriate treatment temperature ([0036]), this reads on applicants' controlling the temperature of the two zones so that the temperature difference between the two zones is minimized during crystal formation. Price also discloses a seeded crystal growth with crystal orientation initiated with a seed crystal of desired orientation, such as 111 or 001 ([0039]). Price also discloses an annealing chamber and slowly cooling the crystals to ambient temperature for 2-30 days, this reads on applicants' annealing by cooling the crystal. Price also discloses CaF_2, BaF_2, MgF_2 and SrF_2 ([0002])

Price does not disclose annealing by cooling at a substantially constant cooling rate.

In a method of manufacturing calcium fluoride crystals, Sakuma et al teaches an annealing process that is conducted in order to improve the optical properties of a single crystal of calcium fluoride. Sakuma et al also teaches the optimum maximum temperature for annealing is between 1020-1150°C, this reads on applicants' first temperature below the melting temperature, and the cooling speed from the maximum temperature to room temperature is set to

be 2°C/hr or less, this reads on applicants' constant cooling rate ([0052]-[0056]). Sakuma et al also teaches the slower the cooling speed, the greater than effect of the improvement on the optical properties. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Price with Sakuma et al's annealing method using a cooling speed of 2°C/hr or less to improve the optical properties of the fluoride crystal, as taught by Sakuma et al.

Referring to claim 3, the combination of Price and Sakuma et al teaches the temperature is between 1020-1150°C, which overlaps the claimed range of 1300-1100°C. Overlapping ranges are held to be obvious (MPEP 2144.05).

Referring to claim 4, the combination of Price and Sakuma et al is silent to the temperature difference between the two zones is less than 50°C. The combination of Price and Sakuma et al does teach the annealing chamber is maintained at a temperature lower than the melting chamber ('402 [0038]) and there is a uniform temperature distribution to reduce thermally induced stresses ('402 [0037]). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Price and Sakuma et al by minimizing the temperature difference between the two zones to 50°C or less to reduce thermal differences, which are undesirable, by performing routine experimentation of a result effective variable.

Referring to claims 5-6, the combination of Price and Sakuma et al teaches cooling to room temperature at a rate of 2°C/hr or less ('625 [0056]).

Referring to claim 7, the combination of Price and Sakuma et al is silent to applying a decreasingly fast cooling profile to the first zone and an increasing layer slow cooling profile to the second zone. It would have been obvious to a person of ordinary skill in the art at the time of

the invention to modify the combination of Price and Sakuma et al by controlling the cooling to obtain an annealing temperature after growth of the crystal, as claimed, because the first zone is at a higher temperature than the second zone.

Referring to claims 8-9, the combination of Price and Sakuma et al is silent to the claimed optical properties for average homogeneity and birefringence, however these properties would are inherent to the calcium fluoride crystal taught by the combination of Price and Sakuma et al because the combination of Price and Sakuma et al teaches a similar method of crystal growth and annealing. Furthermore, the combination of Price and Sakuma et al teaches a cooling rate of less than 2°C/hr and applicants' teach the claimed properties are obtained by using a cooling rate of less than about 3°C/hr (pg 6 [0021] of the instant specification).

13. Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiozawa (US 2001/0019453) in view of Sakuma et al (US 2002/0038625).

Shiozawa discloses a method of calcium fluoride crystal growth comprising a vertical Bridgeman method. Shiozawa also discloses a temperature gradient between the top and bottom heater elements was 50°C and powdered raw material was charged into the chamber and melted. Shiozawa also discloses crystallization was carried out by pulling down at a rate of 1 mm per hour from the high temperature zone to the low temperature zone ([0071]-[0073]), this reads on applicants' two zones.

Shiozawa does not disclose annealing in the cooling zone by cooling the crystal from the first temperature to a final temperature at a substantially constant cooling rate.

In a method of manufacturing calcium fluoride crystals, Sakuma et al teaches an annealing process that is conducted in order to improve the optical properties of a single crystal of calcium fluoride. Sakuma et al also teaches the optimum maximum temperature for annealing is between 1020-1150°C, this reads on applicants' first temperature below the melting temperature, and the cooling speed from the maximum temperature to room temperature is set to be 2°C/hr or less, this reads on applicants' constant cooling rate ([0052]-[0056]). Sakuma et al also teaches the slower the cooling speed, the greater than effect of the improvement on the optical properties. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Shiozawa with Sakuma et al's annealing method using a cooling speed of 2°C/hr or less to improve the optical properties of the fluoride crystal, as taught by Sakuma et al.

Referring to claim 3, the combination of Shiozawa and Sakuma et al teaches the temperature is between 1020-1150°C, which overlaps the claimed range of 1300-1100°C. Overlapping ranges are held to be obvious (MPEP 2144.05).

Referring to claims 5-6, the combination of Shiozawa and Sakuma et al teaches cooling to room temperature at a rate of 2°C/hr or less ('625 [0056]).

Referring to claim 7, the combination of Shiozawa and Sakuma et al is silent to applying a decreasingly fast cooling profile to the first zone and an increasing layer slow cooling profile to the second zone. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Shiozawa and Sakuma et al by controlling the cooling to obtain an annealing temperature after growth of the crystal, as claimed, because the first zone is at a higher temperature than the second zone.

Double Patenting

14. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

15. Claims 1-9 are provisionally rejected under the judicially created doctrine of double patenting over claims 1-22 of copending Application No. 10/652,013. This is a provisional double patenting rejection since the conflicting claims have not yet been patented.

The subject matter claimed in the instant application is fully disclosed in the referenced copending application and would be covered by any patent granted on that copending application since the referenced copending application and the instant application are claiming common subject matter, as follows:

10/652,013 claims a method of making a calcium fluoride crystal comprising hating a calcium fluoride feedstock to a temperature sufficient to form a melt and growing a calcium fluoride crystal through a temperature gradient zone having an axial temperature gradient of 2-8°C/cm (claims 1-5), this reads on applicants' controlling the temperature of the two zones so that temperature difference between the two zones is minimized during crystal formation because

the gradient is small and requires temperature control of both zones. 10/652,013 also claims a first and second zone in a vertical zone, the first zone is used to heat the feedstock and the second zone is used to anneal the crystal (claim 9-12). 10/652,013 also claims the first temperature is in a range of 1300-1100°C (claim 13). 10/652,013 also claims cooling to final temperature between 300-20°C at a rate of 2°C/hr or less (claims 14-18). 10/652,013 also claims a slow cooling profile and a fast cooling profile (claim 19). 10/652,013 also claimed the birefringence is no greater than 1.2 nm/cm and an inhomogeneity no greater than 1.1 ppm (claim 8).

Furthermore, there is no apparent reason why applicant would be prevented from presenting claims corresponding to those of the instant application in the other copending application. See *In re Schneller*, 397 F.2d 350, 158 USPQ 210 (CCPA 1968). See also MPEP § 804.

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Gianoulaskis (US 6,350,310) teaches annealing a CaF_2 crystal from 1000°C to 50°C at a cooling rate of 1°C/hr (col 1, ln 40-67) and a temperature gradient during growth of 100°C (col 2, ln 50-67).

Sakuma et al (US 6,377,332) teaches a temperature gradient during calcium fluoride crystal growth of 70°C/ cm (col 10, ln 1-40).

Wehrhan et al (US 2003/0089307) teaches annealing a fluoride crystal to improve homogeneity to greater than $1x10^{-6}$ and birefringence to less than 1 nm/cm ([0044]).

Lo Iacono (US 6,620,347) teaches a temperature gradient of 1-20°C/cm to grow fluoride crystals (col 7, ln 1-67).

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matthew J Song
Examiner
Art Unit 1765

MJS

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER